The Impact of Late Holocene Climate Change on Polynesia

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In an intriguing article, McCall (1993) suggests that climatic deterioration in the Pacific during the Little Ice Age may have significantly impacted Polynesian voyaging, colonization, and societal development during this period, generally dated as beginning in the thirteenth and fourteenth centuries A.D. and culminating somewhere between the mid-sixteenth and mid-nineteenth centuries. McCall posits that shifts in temperature, rainfall, and wind patterns during the Little Ice Age led to a decrease in voyaging and trade, the abandonment of settlements on such small, marginal "mystery islands" as Nihoa and Necker at the northwest end of the Hawaiian chain and various equatorial atolls, and increased conflict and social disruption on permanently settled but environmentally sensitive islands such as Rapa Nui. However salutary the injection of climate change into discussions of these processes may be, judging from the debate over the impact of climate change on the Maori colonization of Aotearoa (Yen 1961, Leach and Leach 1979, Kirch 1984:127) and attempts to analyze the waxing and waning of Polynesian voyaging, it may be most difficult to reach firm conclusions. In this brief note I would like to outline earlier attempts to introduce climate change into the Polynesian voyaging debate as an example of how problematic environmental change with human events can be.

To begin with, I must take issue with McCall's (1993:67) statement that research in Polynesian voyaging "does not take into account the possible effect of the Little Ice Age." In fact, the subject has been discussed in the pages of at least four major journals: *Nature*; *Science*; *Palaeogeography, Palaeoclimatology, Palaeoecology*; and *American Anthropologist*. McCall's choice of reference for his blanket statement about Polynesian voyaging research, Irwin's (1992) theoretical study of Pacific exploration and colonization, explains why he missed this discussion. Irwin's analysis of Polynesian voyaging, like that of Ward and his colleagues upon which he builds (Levison, Ward and Webb 1973), is based primarily upon simulations of canoes drifting and sailing through a computer-generated wind and current field. As such, their data base for wind and current conditions is limited to compilations of reports from ships and shore stations over the last century of so, far too brief a span to include any major shifts from the Little Ice Age, or the preceding Little Climatic Optimum which arguably stretched from around the seventh or eighth centuries A.D. to the onset of the Little Ice Age.

Over twenty years ago, Wilson and Hendy (1971) and, independently, Bridgeman (1973), hypothesized that the warm, mild conditions of the Little Climatic Optimum may have encouraged Polynesian voyages of exploration and colonization, whereas the colder, stormier conditions of the following Little Ice Age would have discouraged such maritime activity. In analyzing the significance to models of Polynesian voyaging of the first voyage of *Hokule'a* from Hawai'i to Tahiti and return in 1976, I cited these works and pointed out that "although these climate changes may lack full confirmation, we cannot afford to ignore a possible relation between major weather shifts and voyaging patterns." (Finney 1977:1284). Bridgeman (1983) subsequently refined his views, adding that whereas the strong, steady trade winds of the Little Climatic Optimum would have been ideal for Polynesian expansion, the erratic trades of the Little Ice Age and particularly their frequent interruption by prolonged outbreaks of westerlies would have inhibited voyaging. This led me to respond that Bridgeman's hypothesis might not relate to the initial settlement drive eastward across the Pacific, since the primary eastward expansion of the Polynesians and their Lapita predecessors occurred before the periods in question. I also pointed out that an increase in the prevalence and extent of westerly winds such as Bridgeman hypothesizes for the Little Ice Age might actually have facilitated voyaging, not inhibited it (Finney 1985).

My argument concerning westerly winds was based upon ethnographic reports dating back as far as the contact era and our own sailing experiments conducted aboard *Hokule'a*. I proposed that voyagers expanded eastward across the Pacific not by pushing directly against the easterly trade winds, but rather by "sailing smart"--by waiting for westerly wind shifts which occur periodically (and are more intensive and prolonged during El Niño events), and then using those to push eastward at least as far as Rapa Nui if not beyond (Finney 1985). Furthermore, I suggested that the alteration of easterly and westerly winds would have facilitated sailing back and forth between widely separated islands. In 1986 we had the chance to demonstrate how to move from west to east across Polynesia by exploiting westerly wind shifts to sail *Hokule'a* from Samoa to Tahiti. Since the year before we had used easterly winds to sail from Tahiti to Samoa, the two voyages taken together demonstrated how to use alternating easterly and westerly winds to sail back and forth across Polynesia (Babayan et al. 1987, Finney

1988, Finney et al. 1989). Most recently Caviedes and Waylen (1993) have documented how the westerlies of the major 1982-1983 El Niño event swept all the way to Rapa Nui, and have proposed that the island was first colonized by voyagers taking advantage of a similarly extensive episode of El Niño westerlies in the distant past (cf. Finney 1985:18; 1993:3).

Yet, although the hypothesized greater prominence of westerlies and their more frequent alternative with easterly trade winds during the Little Ice Age might seem ideal for extensive voyaging, we should not forget Bridgeman's thesis that an increase in storminess during this period may have greatly dampened enthusiasm for taking to the sea, leading to a overall reduction in voyaging at this time. This seeming contradiction highlights the central problem in such theorizing: we really do not have sufficient data on the exact local manifestations in Polynesia of major climate shifts, much less on coeval changes in voyaging, colonization and the development of individual societies. Until we have more abundant and precise data, hypothesizing and counter-hypothesizing about how the Little Climatic Optimum and the Little Ice Age impacted local weather conditions and through them human activities can go on and on without resolution.

Given this situation, hypotheses concerning changes in voyaging, colonization, and societal development that do not depend upon marked climatic shifts become more appealing. For example, the apparent decline in overseas voyaging that occurred in resource-rich, high island archipelagos might be explained in part at least in terms of resource distribution and opportunity cost. Unlike the people living on coral atolls and upraised coraline islands who had to voyage to obtain needed resources from neighboring high, volcanic islands, the high islanders themselves did not need to make long voyages outside their respective archipelagos to obtain stone for tools, timber for canoes and other resources. If anything, their energies at the time of contact appear to have been much more focused on local agricultural development and internal chiefly competition than on building and maintaining canoes, and employing them for overseas ventures. Similarly, settlements on tiny, marginal islands may have been abandoned simply because they were too small and ecologically fragile to sustain permanent human occupation, not because of any significant climate shift. Alternatively, Weisler (in press) has recently suggested that the miniature high island of Pitcairn and its even tinier coraline outlier, Henderson Island, may have been abandoned when the Mangarevans deforested their island and consequently could no longer build and maintain large voyaging canoes needed for the inter-island exchange of raw materials and finished goods between Mangareva and its outliers that made human settlement on the latter islands viable.

In light of the problematic nature of estimating the exact local manifestations of global climate shifts and of their putative impacts on human activities, as well as the availability of alternate hypotheses of social change that do not depend upon such shaky reasoning it is tempting to ignore suggestions that the Little Climatic Optimum and the Little Ice Age had a significant impact on Polynesian history, and to concentrate solely on factors internal to the island societies themselves and the pattern of resources on the islands in question. Yet just because it may be more comfortable to work with endogenous factors does not necessarily mean that currently uncertain local effects of global climate shifts may not have played a role in Polynesian history, particularly on islands such as Rapa Nui vulnerable to "ecological crunches" brought about by changes in temperature, wind patterns and rainfall (Terrell 1986:92-93, Wiens 1877). Furthermore, the synergistic possibilities of over exploitation during a time of climatic stress should not be overlooked. All in all, despite obvious problems I would say that McCall does us a service in calling for an explanation of the possible impacts of major climatic shifts on voyaging, colonization, and the development of Rapa Nui society.

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by Grant McCall

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Reviews of new books
and the BBC video, "Nomads of the Wind"

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Another moai sighting: a statue constructed of steel and concrete stands in Samford, Australia. The form was designed and built by Werner Kroll from a drawing in Katherine Routledge's book, Mystery of Easter Island. It is hollow and filled with "time messages" placed in bottles. A loudspeaker was originally placed inside the moai [oh, if those statues could only speak...] but this device fell victim to the humidity. Photo credit: Bernard Kroll.